


Scavenger Wells Stop Saltwater Intrusion in Baton Rouge

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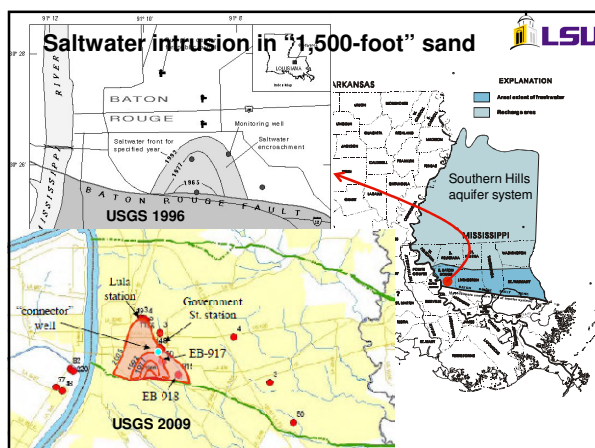
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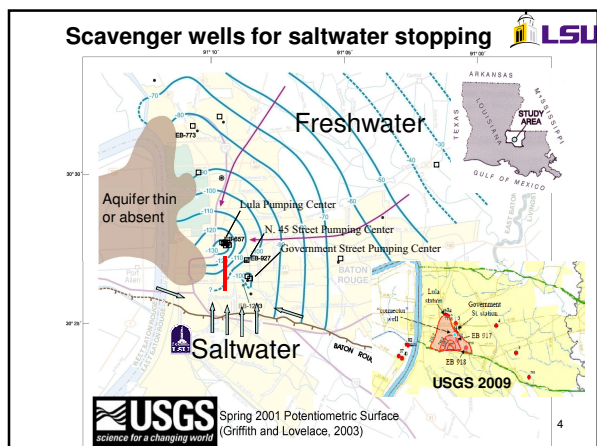


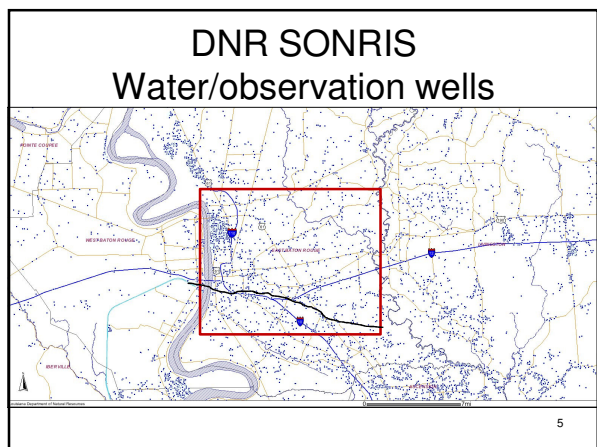
Acknowledgements

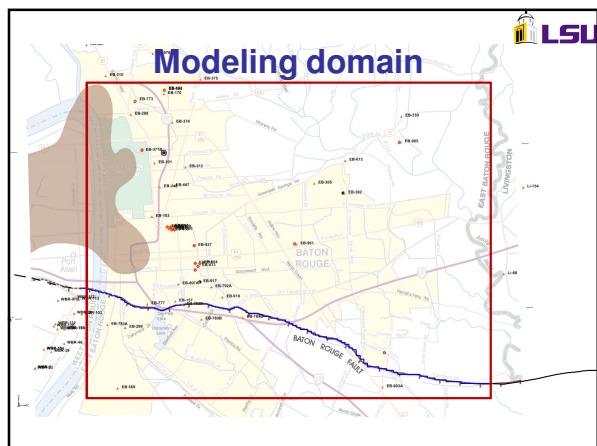
- Baton Rouge Water Company
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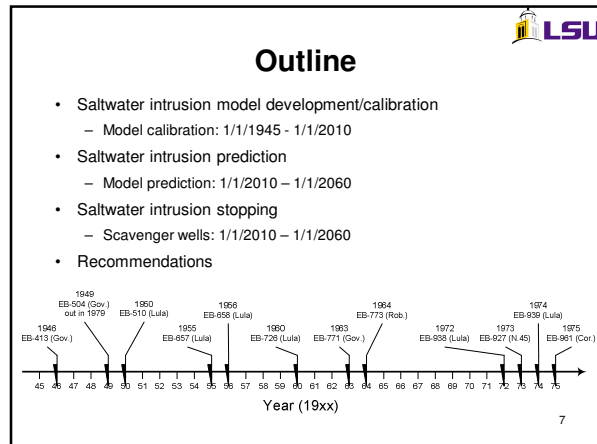
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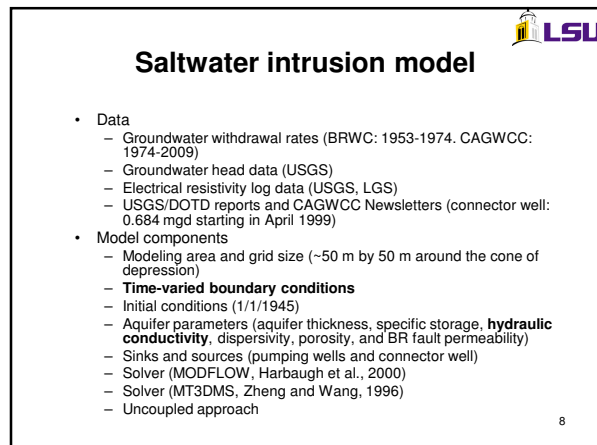


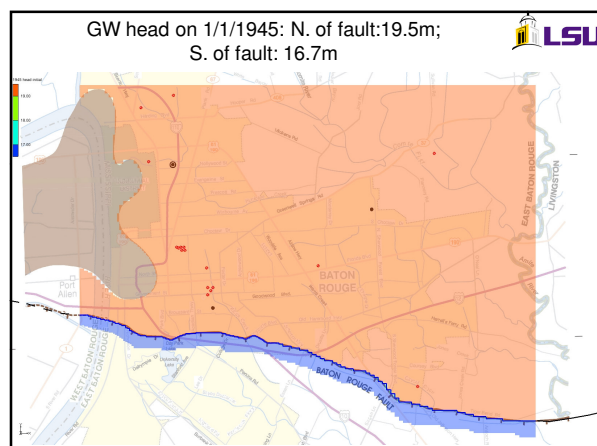












MODFLOW parameters

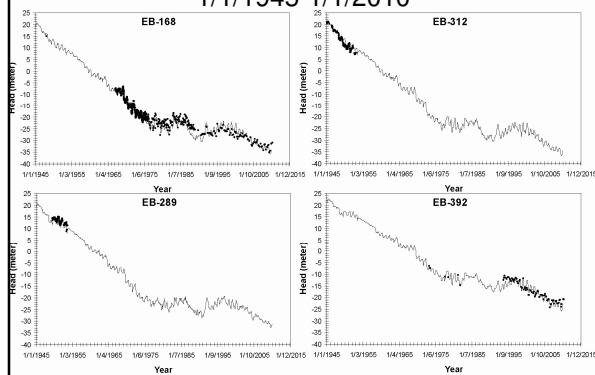


Parameter	Value	Unit
Hydraulic conductivity for the "1,500-foot" sand and "1,200-foot" sand	55.0	m/day
Specific storage	2.2104×10^{-5}	m^{-1}
Horizontal barrier from the west boundary extending eastward to 7,821m (intersection of Wards Creek and Corporate Blvd)	8.0×10^{-4}	day^{-1}
Horizontal barrier for rest of the fault line	3.5×10^{-4}	day^{-1}
Initial head (01/01/1945) north of the fault	19.5	m
Initial head (01/01/1945) south of the fault	16.5	m

Groundwater model calibration



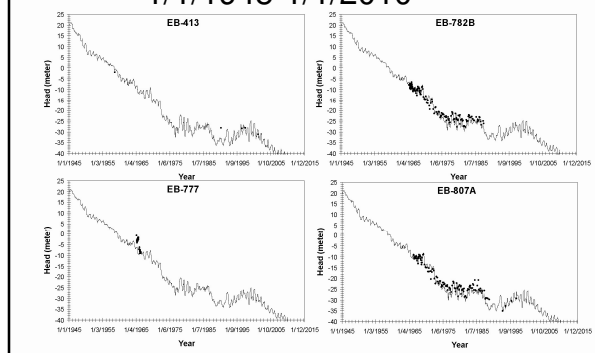
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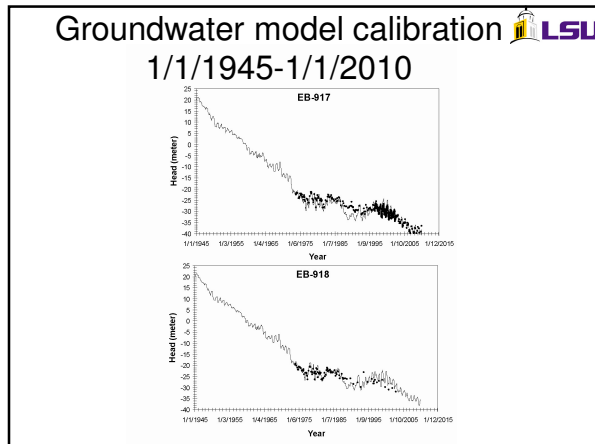


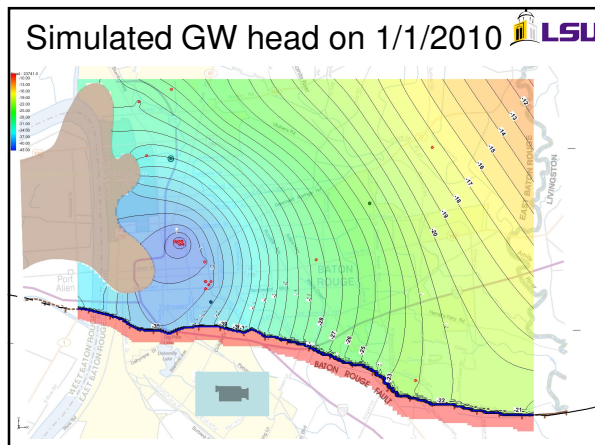
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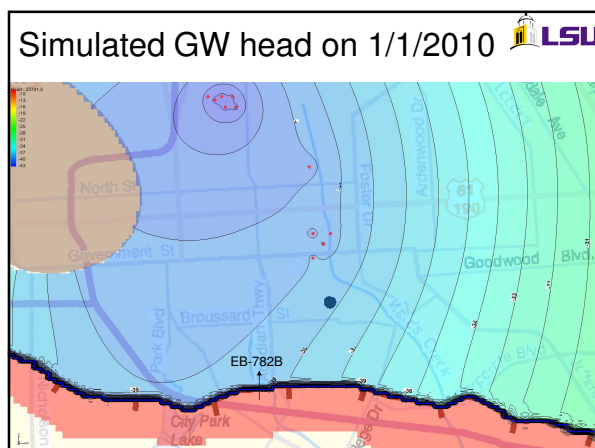


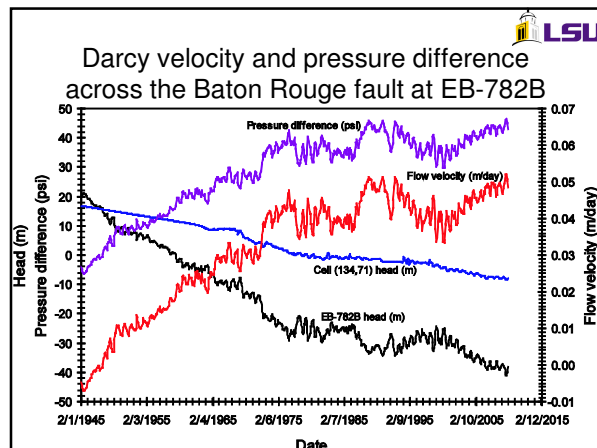
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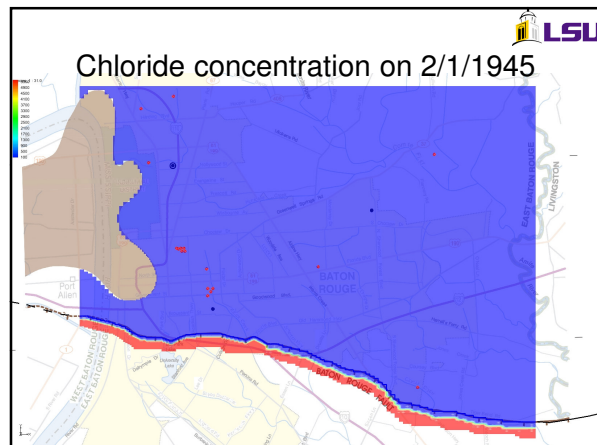








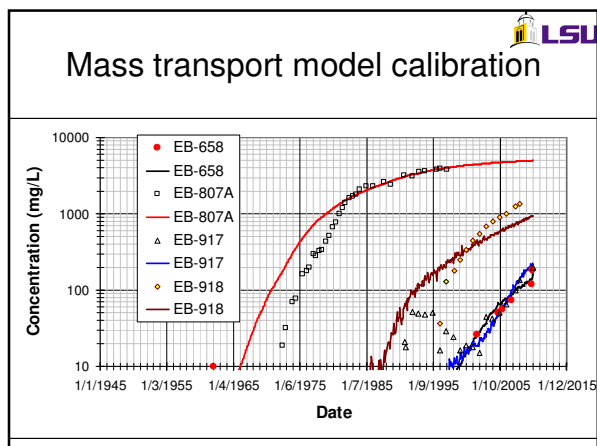


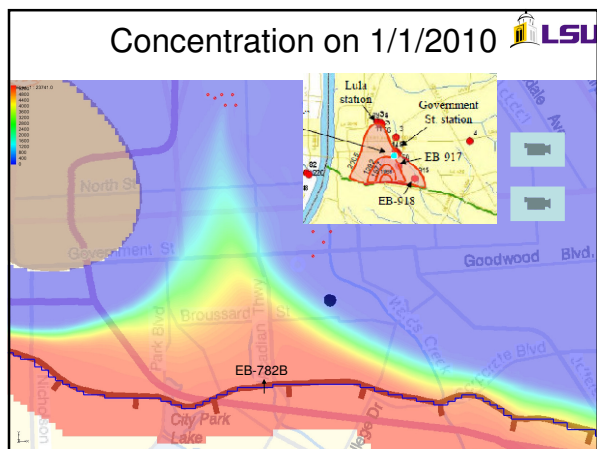


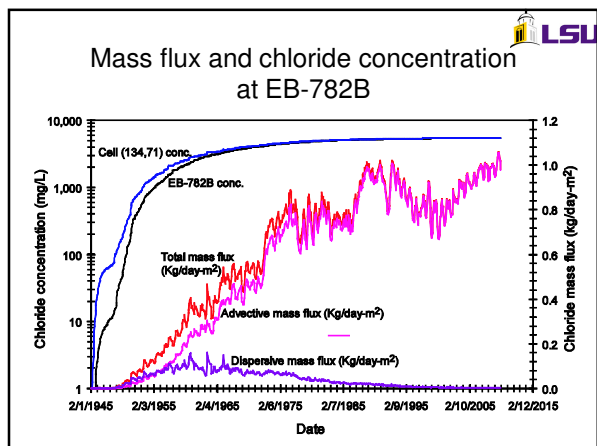
LSU


MT3DMS parameters

Parameter	Value	Unit
Initial concentration distribution (01/01/1945), south of the fault	5500	mg/L
Initial concentration distribution (01/01/1945), north of the fault	0	mg/L
Constant concentration at southern boundary	5500	mg/L
Porosity	0.27	-
Longitudinal dispersivity	180	m
Transverse dispersivity	0.36	m
Diffusion coefficient	0	m ² /day











Scavenger wells



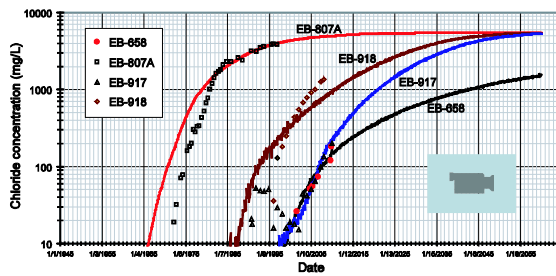
Monthly pumpage for 2010-2059

USGS Well Name	Local Name	Row	Column	5-year average withdrawal rate (m ³ /day)	5-year average withdrawal rate (mgd)
EB-371B	DSM	24	27	0	0
EB-413	Government-03	92	87	5440.6	1.437
EB-504	Government-04	89	89	0	0
EB-510	Lula-17	50	58	5644.0	1.491
EB-657	Lula-18	50	54	993.9	0.263
EB-658	Lula-19	53	59	4793.6	1.266
EB-726	Lula-20	53	62	5989.9	1.583
EB-771	Government-06	89	84	4137.4	1.093
EB-773	Robin-01	11	22	1789.6	0.473
EB-905	Parish Water	22	171	0	0
EB-927	N. 45 th -03	70	83	6403.9	1.692
EB-938	Lula-22	51	56	5146.0	1.360
EB-939	Lula-23	50	61	4178.9	1.104
EB-961	Cortana-05	68	143	801.1	0.212
EB-996	BRWC	8	51	0	0
EB-1295C	Stumberg-02	164	167	1787.3	0.472
EB-1293	Connector Well	96	84	-2589.0	-0.684

Total: 12.5 MGD



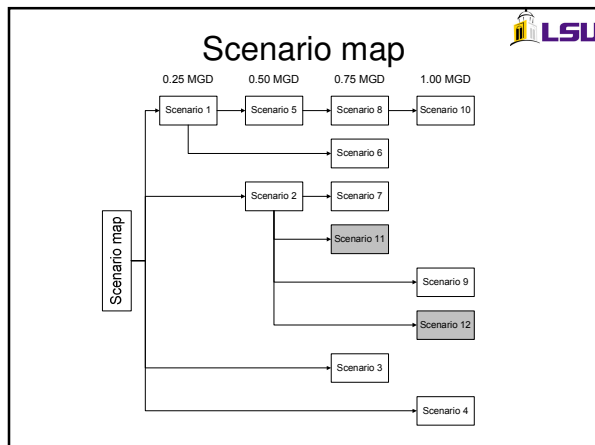
No action

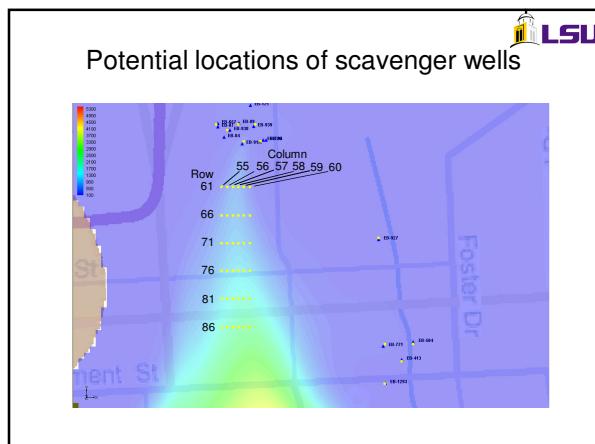


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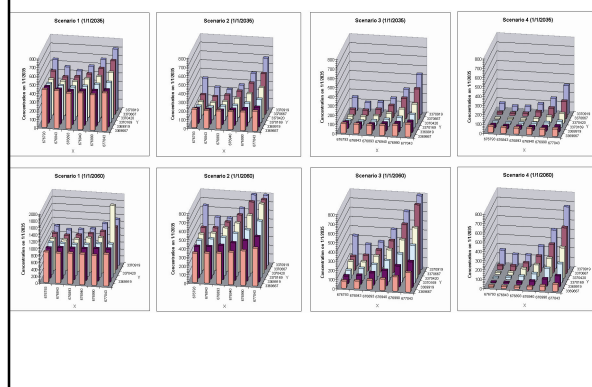
Scavenger well scenarios (starting 1/1/2011)

Scenario	Scavenger well operation (SWOP)
1	One scavenger well with 0.25 mgd
2	One scavenger well with 0.50 mgd
3	One scavenger well with 0.75 mgd
4	One scavenger well with 1.00 mgd
5	Two concurrent scavenger wells: Well #1 with 0.25 mgd and Well #2 with 0.25 mgd
6	Two concurrent scavenger wells: Well #1 with 0.25 mgd and Well #2 with 0.50 mgd
7	Two concurrent scavenger wells: Well #1 with 0.50 mgd and Well #2 with 0.25 mgd
8	Three concurrent scavenger wells: Well #1 with 0.25 mgd, Well #2 with 0.25 mgd, and Well #3 with 0.25 mgd
9	Two concurrent scavenger wells: Well #1 with 0.50 mgd and Well #2 with 0.50 mgd
10	Four concurrent scavenger wells: Well #1 with 0.25 mgd, Well #2 with 0.25 mgd, Well #3 with 0.25 mgd, and Well #4 with 0.25 mgd
11	Two sequential scavenger wells: Well #1 with 0.50 mgd and Well #2 with 0.25 mgd
12	Two sequential scavenger wells: Well #1 with 0.50 mgd and Well #2 with 0.50 mgd

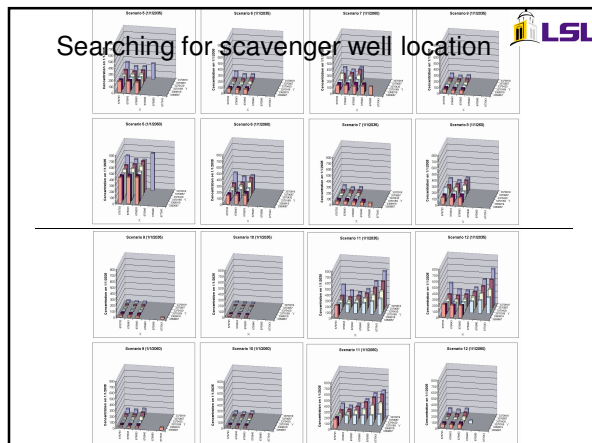




Searching for scavenger well location



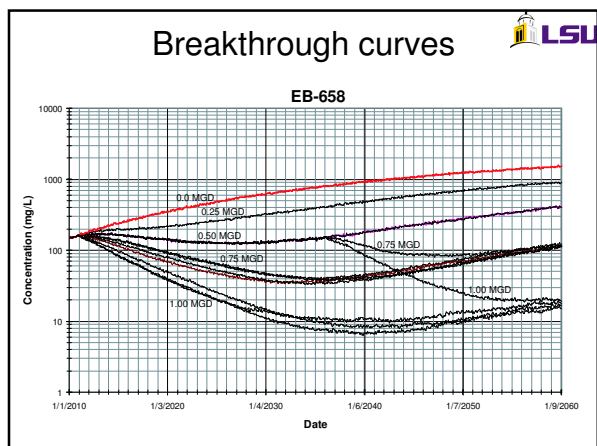
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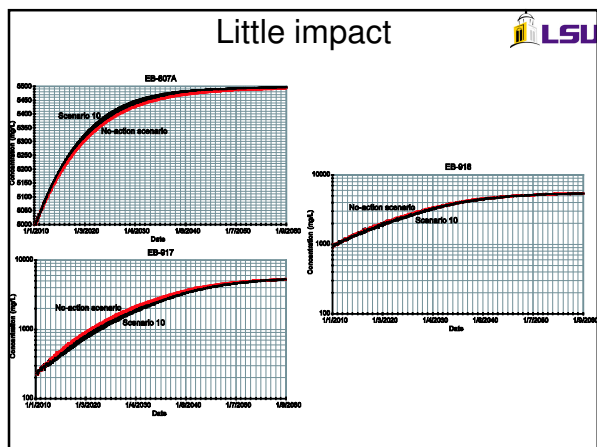


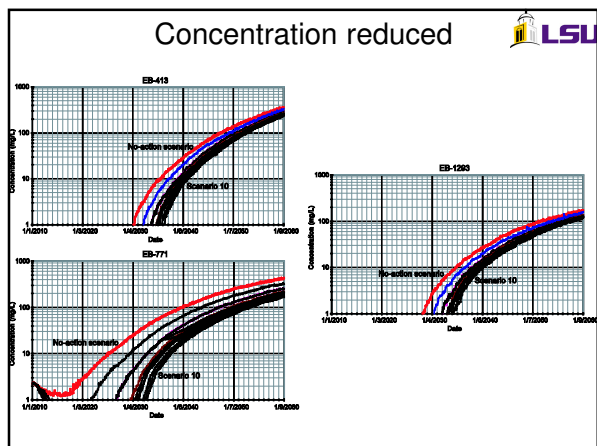
Location and results



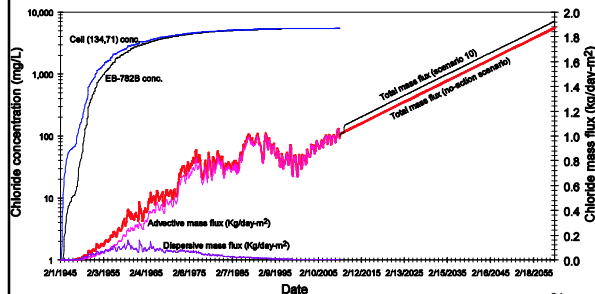
Scenario	Location	Concentration at EB-658	
		1/1/2035	1/1/2060
No action	-	754	1540
1	Well #1 (76,57)	385	903
2	Well #1 (76,56)	143	412
3	Well #1 (76,56)	40	122
4	Well #1 (71,55)	10	17
5	Well #1 (76,57), Well #2 (76,55)	147	399
6	Well #1 (76,57), Well #2 (71,55)	35	114
7	Well #1 (76,56), Well #2 (76,55)	39	115
8	Well #1 (76,57), Well #2 (76,55) Well #3 (71,55)	33	110
9	Well #1 (76,56), Well #2 (71,55)	9	15
10	Well #1 (76,57), Well #2 (76,55) Well #3 (71,55), Well #4 (66,55)	7	16
11	Well #1 (76,56), Well #2 (71,55)	143	116
12	Well #1 (76,56), Well #2 (71,55)	143	19







Little increase in chloride mass flux across the BR fault



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Conclusions



- Stopping performance using multiple scavenger wells is similar to using a single scavenger well for the same total extraction rates.
- Using multiple wells may be preferred because it creates less drawdown around scavenger wells
- Scavenger wells under tested scenarios may have little negative impact on chloride concentration in EB-807A, EB-917 and EB-918 and may slightly increase saltwater crossing the Baton Rouge fault.
- Scavenger wells under tested scenarios may effectively reduce chloride concentration in Government wells (EB-413 and EB-771) and in the "connector well" (EB-1293).
- Using scavenger wells with less than 1 mgd of total extraction rates may add at least 50 years to the life of Lula wells.